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(54) A fuse-disconnecting switch.

(57) A fuse load-disconnecting switch (1) which is provided with a casing with connections to (6, 6′, 6″; 3, 4, 5), and from (3′, 4′, 5′; 7, 7′, 7″) the respective fuse-link cartridges (2, 2′, 2″) which are dismountably provided in said casing, and in which at least one of said connections to the respective fuse-link cartridge is provided with a switch connection (3, 4, 5; 11; 3′, 4′, 5′), and where the poles on the switch connections in the respective connections are provided serially, one behind the other, along a common operation rod (10) which influences the respective switch connections simultaneously. Operation rod (10) may be influenced, via a tilting mechanism (8, 8′, 8″), by a manually actuatable operation handle (9).

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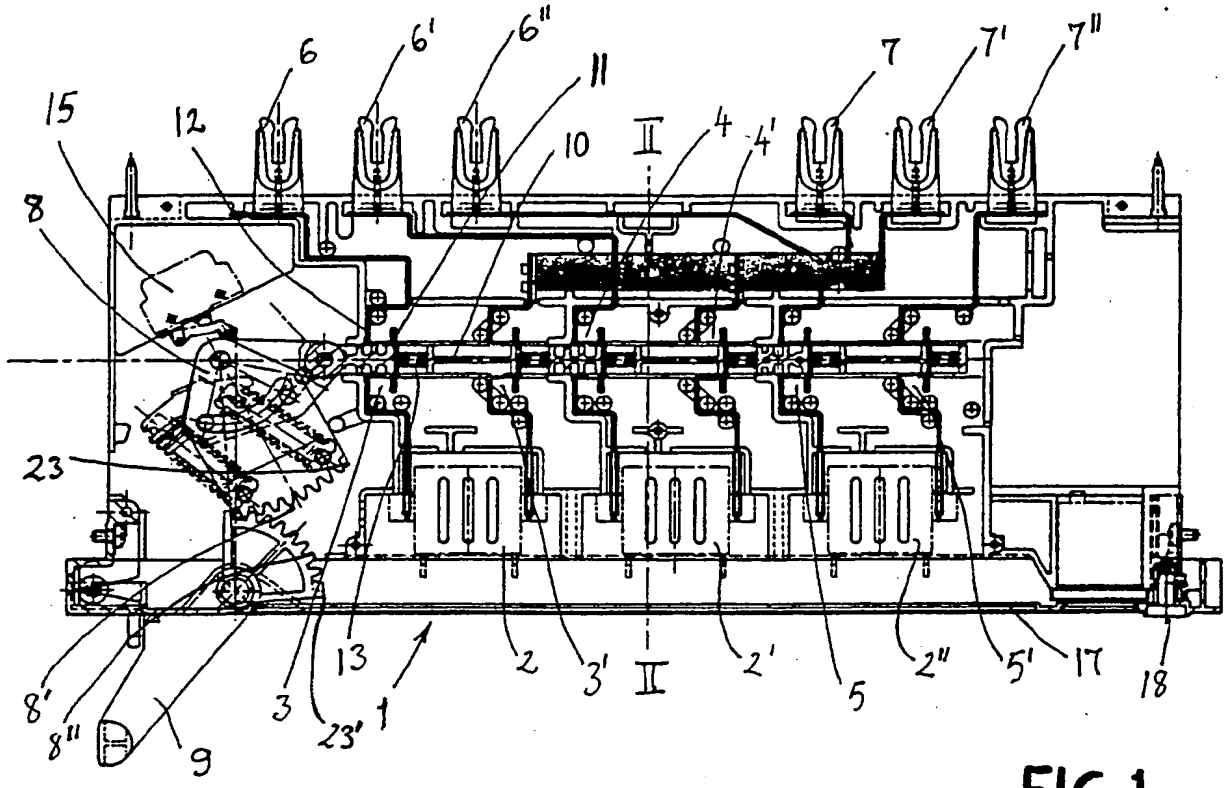

FIG.1

A FUSE-DISCONNECTING SWITCH.

The present invention relates to a fuse-disconnecting switch which is provided with a casing with connections to and from respective fuse-link cartridges which are dismountably provided in said casing.

International IEC-regulations define various categories of electric switches, e.g. AC3 for operation of single motors, AC23 for operation of motors in groups, and AC22 for a mixed load (e.g. motors and a resistive load). This means that a device for AC22 operation may have a simpler structure (switching function) than devices for AC23 and AC3 categories.

In case of a disconnected switch it is especially important that the switch cannot be connected unintentionally when a fuse cover across the switch is open.

At present a large number of different designs of fuse switches is known, both fuse panels with the poles arranged serially, one behind the other, or conventional fuse switches with the poles provided in parallel, side by side. It is common to these different designs that devices for the lowest switch categories according to IEC are often provided with a switching function depending on actuation, whereas devices for AC23/AC3 operation have a switching function not depending on actuation. These different switches are structurally very different and, consequently have different external dimensions. This means that electrical distribution plants which may comprise courses with different switch categories and, thus, require different kinds of devices, are unnecessarily complicated to build.

Another complicating factor is that every single manufacturer of distribution plants (panels, frames, and cabinets) often has a special localization of distributing bus-bars to which devices are to be connected.

It is an object of the present invention to overcome the above problems by designing fuse load-disconnecting switches (fuse panels) with equal external dimensions and by use of the same method of mounting various categories of switches.

According to the invention the fuse load-disconnecting switch is characterized by the fact that said connections are provided with a switch connection either in front of or both in front of and behind respective fuse-link cartridges, and that the poles of the switch connections in respective connections are provided in series, one behind the other, along a common operation rod influencing the respective switch connections simultaneously.

Further characterizing features of the fuse load-disconnecting switch will appear from the following claims, as well as from the disclosure below with reference to attached drawings.

Figure 1 shows a first embodiment of the disconnecting switch according to the invention,

Figure 2 is a sectional view of II-II in Figure 1,

Figure 3 shows an end view of the embodiment as shown in Figure 1,

Figure 4 shows a second embodiment of the switch according to the invention, and

Figure 5 shows a front view of the switch of Figure 4.

Figure 6 shows a third embodiment of the switch according to the invention.

Figure 7 shows a fourth embodiment of the switch according to the invention.

Figure 8 shows a fifth embodiment of the switch according to the invention.

Figure 9 illustrates a first embodiment of a locking mechanism for the switch according to the invention.

Figure 10 is a front view of the concept according to Figure 9.

Figure 11 shows a second embodiment of the locking mechanism according to the invention, and

Figure 12 is a front view of the switch with its locking mechanism.

In Figure 1 a fuse load-disconnecting switch 1 which has cartridge fuse-links 2, 2′, 2″ is shown. The switch is of the AC3/AC23 (SMR) type, which has a break both in front of and behind the fuse, i.e. both in the connection to and from the fuse-link cartridge. The switch connection, thus, provided for fuse 2 is designated by numeral 3, and in the lead from the fuse the switch connection is designated by numeral 3′. Corresponding numerals for fuse 2′ are 4 and 4′, and for fuse 2″ numerals 5, and 5′, respectively, are used.

It will appear from Figure 1 that the leads to respective fuse-link cartridges 2, 2′, and 2″ may be connected with respective busbars (not shown), via connecting contacts 6, 6′, 6″. Correspondingly, the leads from respective fuse-link cartridges 2, 2′, 2″ may be connected with connecting contacts 7, 7′, 7″, and the latter may be connected with the desired load. Via a tilting mechanism 8, which is influenced by a rotatable handle 9, externally provided on switch casing 1, an operation rod 10 is caused to move in one or the other direction. When handle 9 is turned anticlockwise, the movable member 11, e.g. of switch connection 3, will move towards the stationary member 12 of the switch. In order to ensure the best possible locking of movable contact 11 of the switch, a spring mechanism 13 may be provided to ensure the necessary con-

tact pressure for current transfer to stationary member 12 of the switch. In the embodiment shown in Figure 1 terminals 6, 6′, 6″ are provided at a certain mutual distance, e.g. equal to 50 mm in the elected embodiment. Correspondingly, terminals 7, 7′, 7″ are also provided at a mutual distance equal to 50 mm.

It will also appear that the cartridge fuse-links are firmly held by clamping means 14, known per se, cf. Figure 2. For desired remote control of the connected or disconnected state of the switch in connection with said tilting mechanism 8, e.g. a microswitch 15 may be provided to sense the operative state of the switch.

The concept of Figure 4 in many ways corresponds to that of Figure 1, apart from the fact that terminals 7, 7′, 7″ are replaced by cable connection terminals 16, 16′, 16″. In the shown case terminals 6, 6′, 6″ are, furthermore, provided at a certain mutual distance, in the elected embodiment equal to 185 mm.

Said two mutual distances, 50 and 185 mm, are calculated to simplify the use of the switches in various panels and systems without much need for adaption. The most common panel systems roughly have the following busbar dimensions:
Thickness 5 mm - Distance of busbars 50 mm,
Thickness 10 mm - Distance of busbars 100 mm, and
Thickness 10 mm - Distance of busbars 185 mm.

Figure 6 shows another variant of the embodiment of Figure 1, in which terminals 6, 6′, 6″ are provided as shown in Figure 1, but in which terminals 7, 7′, 7″ are replaced by terminals 16, 16′, 16″, as shown in Figure 4, with terminals 6, 6′, 6″ in Figure 6 having a mutual distance of 50 mm in stead of what is shown in Figure 4, viz. a mutual distance of 185 mm. For the rest, operation and structure of Figure 6 correspond to the embodiments of Figure 1 and Figure 4.

In Figure 7, which in many ways is like the embodiment of Figure 4, the terminals 6,6′ ,6″ have a mutual distance which is preferably 185 mm.

As compared to what is shown in Figure 1, in Figure 7 there are no switch connections 3′, 4′, and 5′, as the leads from the respective fuse-link cartridge are connected directly to out-terminals 16, 16′, 16″.

Figure 8 shows a minor variant of the concept of Figure 7. Contact terminals 6, 6′, 6″ are there provided at a mutual distance of 50 mm, whereas the leads from respective fuse-link cartridges are connected with previously mentioned terminals 16, 16′, 16″, via internal current-carrying connections, as shown.

The switch concepts of Figures 7 and 8 are intended for switch category AC22 (SER) which has a break in front of the fuse (in the feeding line).

It should be mentioned that an advantage of the concept shown in the mentioned Figures 1-8 is that the fuses also sit in line. The switch apparatus configurations shown in Figures 1-8 may be implemented within the same module dimensions and with the same main components. It will also appear that structurally the casings of various concepts are alike, apart from internal connection paths. This means that not more than one module is required for a starting member, and the same module dimensions may be used to manufacture all the kinds shown in Figures 1-8.

The present invention, thus, provides the unique situation that it will be possible to mix devices which are selected for their application, within the same panel area of the devices without converting busbars and areas. To the user this will be a more inexpensive concept, besides providing for a more optimal utilization of the said panel area. The SER kind (SER only having a break in front of or in the feed line to the fuse-link cartridge), has fewer contact joints than SMR which has a break both in front of and behind the fuse-link cartridge. Total loss of efficiency and increase of temperature from SER will, thus, be considerably lower than in case of SMR.

The indicated concept will, thus, permit providing a switch device panel area with more exits of switches of the SER kind than of the SMR kind.

The advantages of the SMS type, in addition to improved technical data, are that the replacement of fuses may be carried out in the confident assurance that the fuse contacts are in a dead state due to a break both in front of and behind the fuse. This is why it is also very well suited for use as a feed switch.

For fuse load-disconnecting switches which are independent of actuation with the connecting switch contacts being operated by a moment mechanism/spring mechanism, a locking mechanism must be present to prevent the protective cover 17 across fuses 2, 2′, 2″ from being opened when the switch is on. This is a safety measure to prevent the incompetent from access to live portions. With a disconnected switch, however, the fuses are dead and there is no danger when the cover across them is opened and fuses are accessible. In order to check the state of voltage in the plant, a skilled electrician, however, needs access to the fuses when the switch is connected. This problem is solved by the fact that a skilled person may use a tool, e.g. a screw driver to release a locking mechanism 18 and 21 on the fuse cover. In case of a disconnected switch it is important that the switch cannot unintentionally be switched on when the fuse cover is open. This is taken care of by the fact that the actuating means 9 of the switch is mounted in the cover and is connected with

mechanism 8, 8′ of the switch, via toothed segments 8″. When the actuation means of the switch is turned outwards, together with the pivotable hinged fuse cover, the engagement between toothed segments 8′, 8″ will be released. It should also be mentioned that cover 17 cannot be returned into its covering position if toothed segments 8′, 8″ are in a wrong mutual position. It will appear that toothed segment 8″ has a double tooth 23 lowermost, and that there is a corresponding arrangement 23′ of toothed segment 8′.

As will appear in more detail from Figures 9 and 10, an arm 19 (Figure 9), 20 (Figure 11) is provided on said operation rod to be movable with said rod and project towards the front of the switch. In Figure 9 arm 19 will cause engagement with a locking pin 21 on the cover 17 when the switch is in an operative state, so that cover 17 cannot be opened when the switch is in an operative state. This represents an additional safety measure against undesired opening of the cover when the switch is live. Correspondingly, there is an engagement in the concept of Figure 11 between arm 20 and a locking pin 22, so that cover 17 cannot be opened as long as there is an engagement between arm 20 and pin 22. In the concepts of Figures 9-12 lock 18, thus, represents an additional safety measure even though engagement of members 19, 21, and 20, 22, respectively, is sufficient for normal operation.

Claims

1. A fuse load-disconnecting switch which is provided with a casing with connections to and from the respective fuse-link cartridges which are dismountably arranged in said casing,
characterized in that said connections are provided with a switch connection either in front of or both in front of and behind the respective fuse-link cartridges, and that the poles of the switch connections in respective connections are provided serially, one behind the other, along a common operation rod which influences respective switch connections simultaneously.

2. A fuse load-disconnecting switch as stated in claim 1,
characterized in that the operation rod may be influenced, via a tilting mechanism or the like, by a manually operated handle.

3. A fuse load-disconnecting switch as stated in claim 1 or 2,
characterized in that said operation rod is provided with spring loaded switch contact members.

4. A fuse load-disconnecting switch as stated in one or more of the preceding claims,
characterized in that both said connections to and from the respective fuse-link cartridge are provided with a switch connection.

5. A fuse load-disconnecting swith as stated in one or several of the preceding claims,
characterized in that a contact terminal designed for engagement with a busbar is provided on the rear side of the casing on at least one of said connections to a respective fuse-link cartridge.

6. A fuse load-disconnecting switch as stated in claim 5,
characterized in that there are three fuse-link cartridges and three of said contact terminals with a mutual distance between terminals of 50 mm or 185 mm.

7. A fuse load-disconnecting switch as stated in one or several of claims 1-5,
characterized in that there are three fuse-link cartridges, and that there are contact terminals on the rear side of the casing for the connections to and from respective fuse-link cartridges, and that the mutual distance between feed-connection contact terminals is 50 mm, and that the mutual distance between from-connection contact terminals is also 50 mm.

8. A fuse load-disconnecting switch as stated in one or several of the preceding claims,
characterized in that a locking arm is rigidly provided on the operation rod to project towards the front of the casing which arm in the operative state of the disconnecting switch with its front end firmly locks a cover of said fuse-link cartridges, and in the disconnected state of the disconnecting switch with its front end gets clear of a locking pin on said cover.

FIG.3

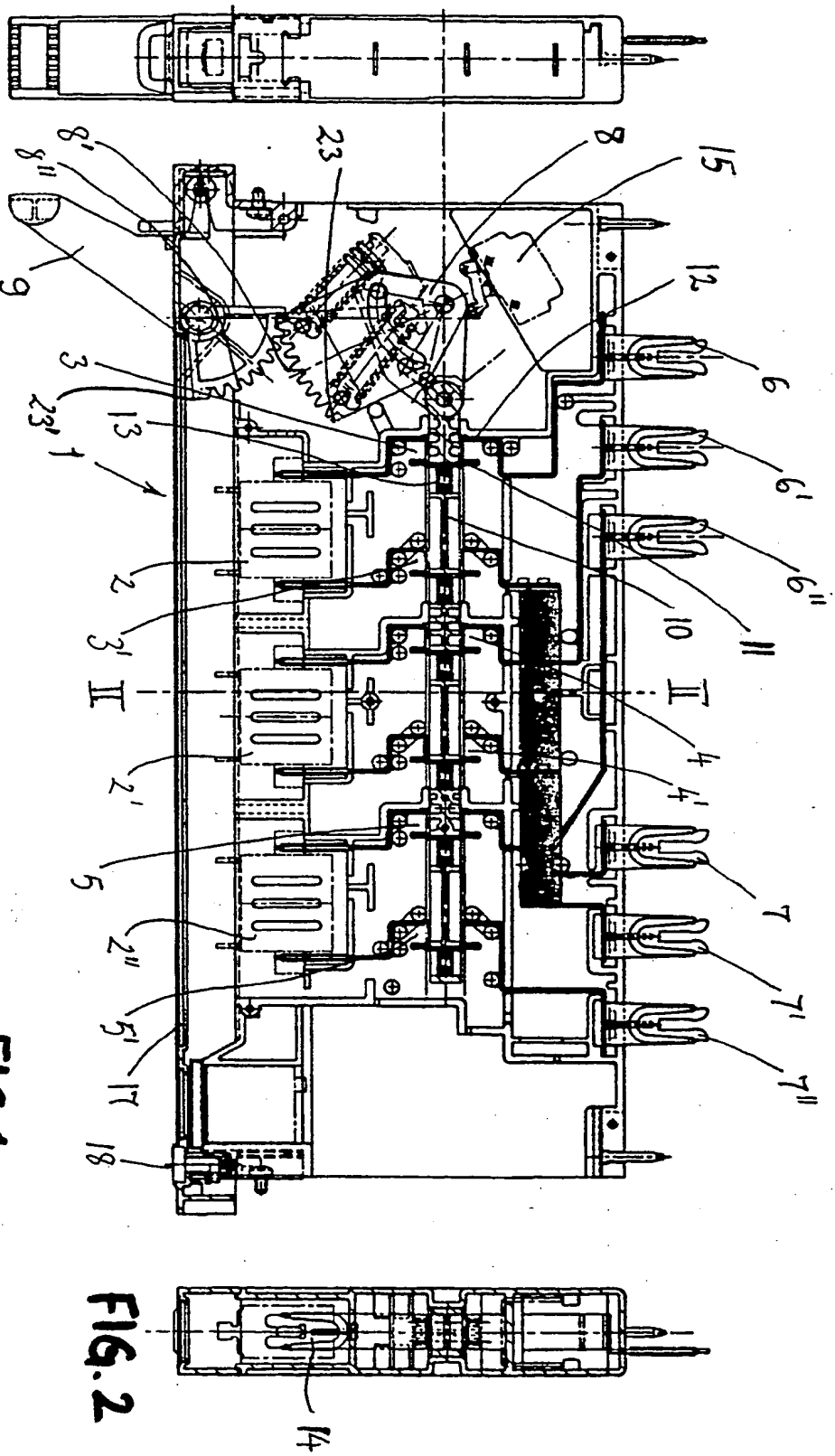

FIG.1

FIG.2

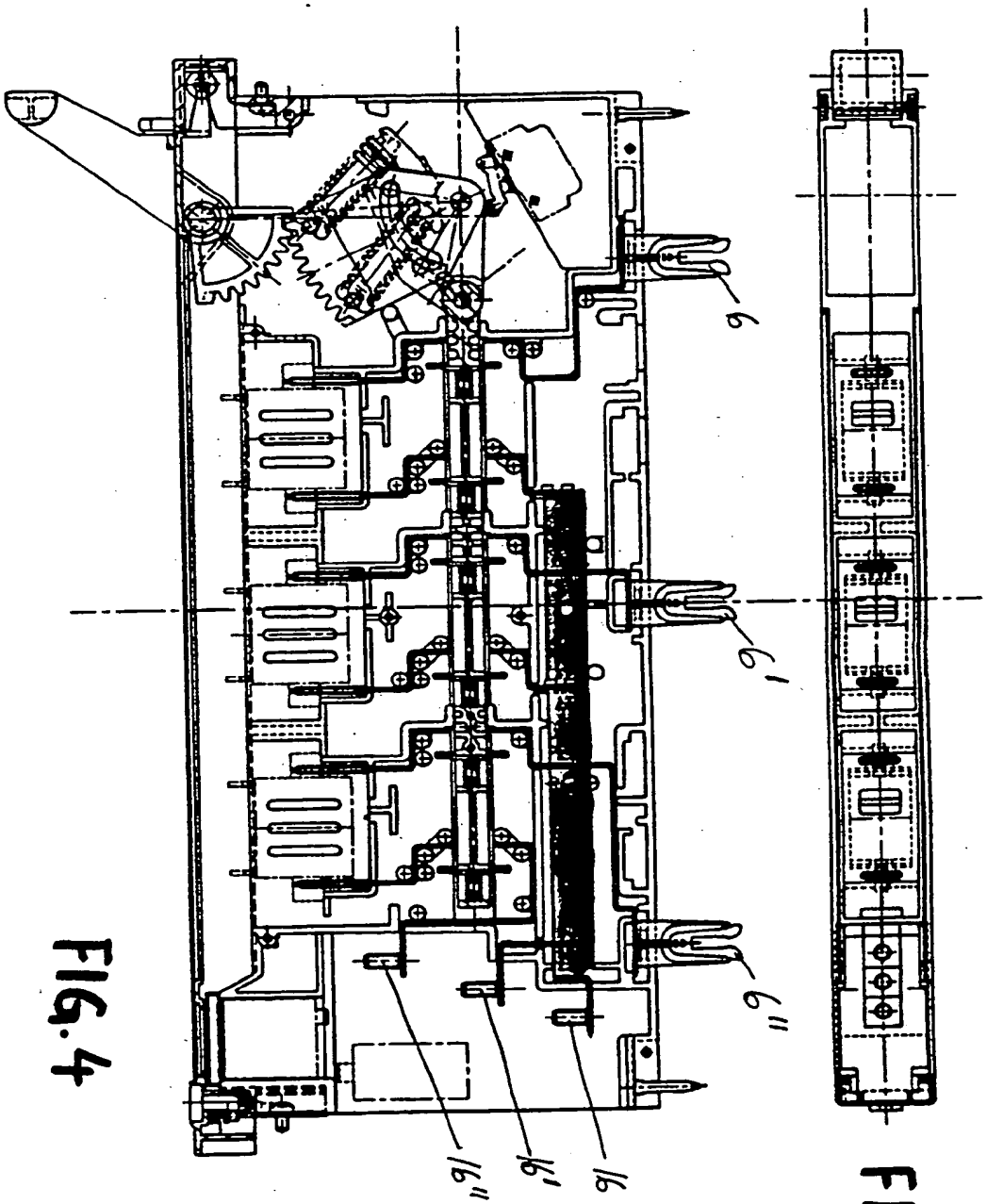

FIG.4

FIG.5

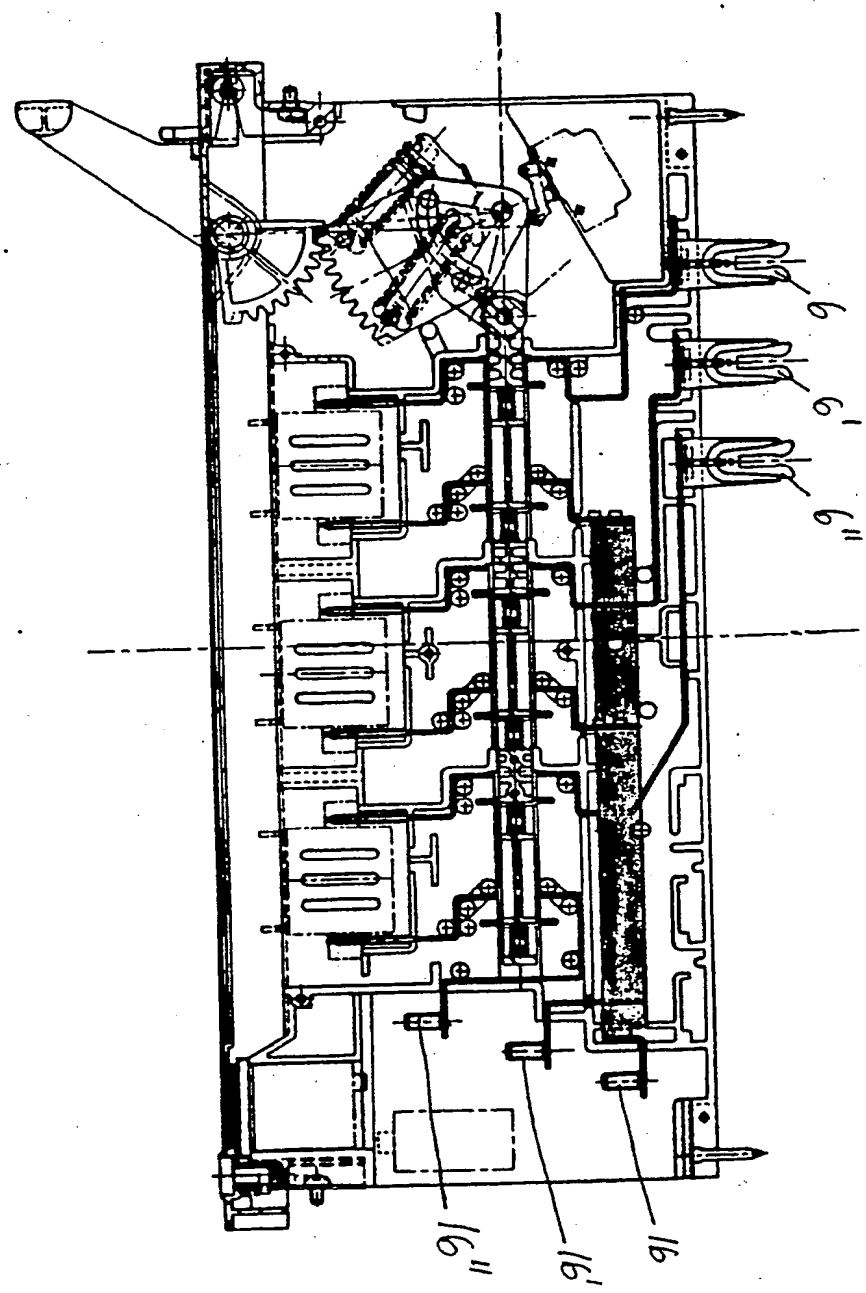

FIG.6

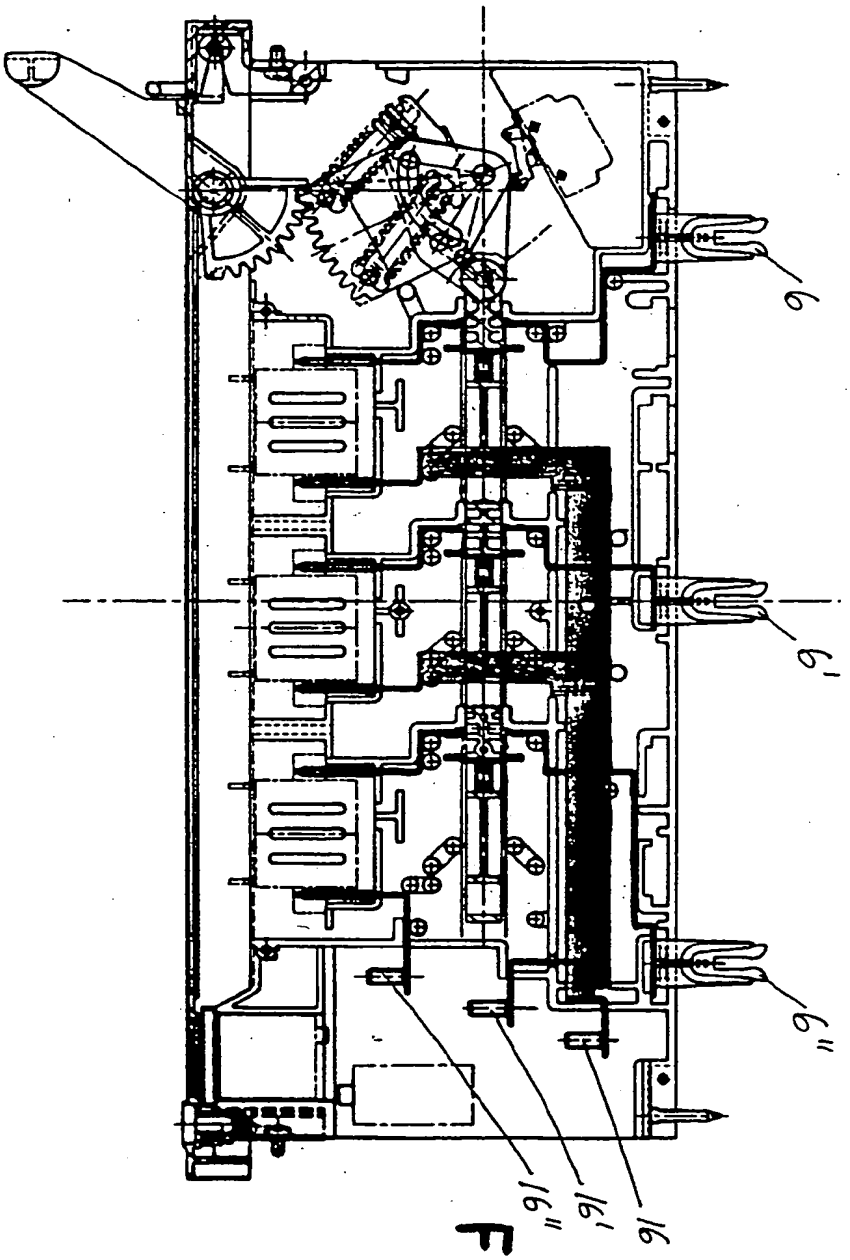

FIG. 7

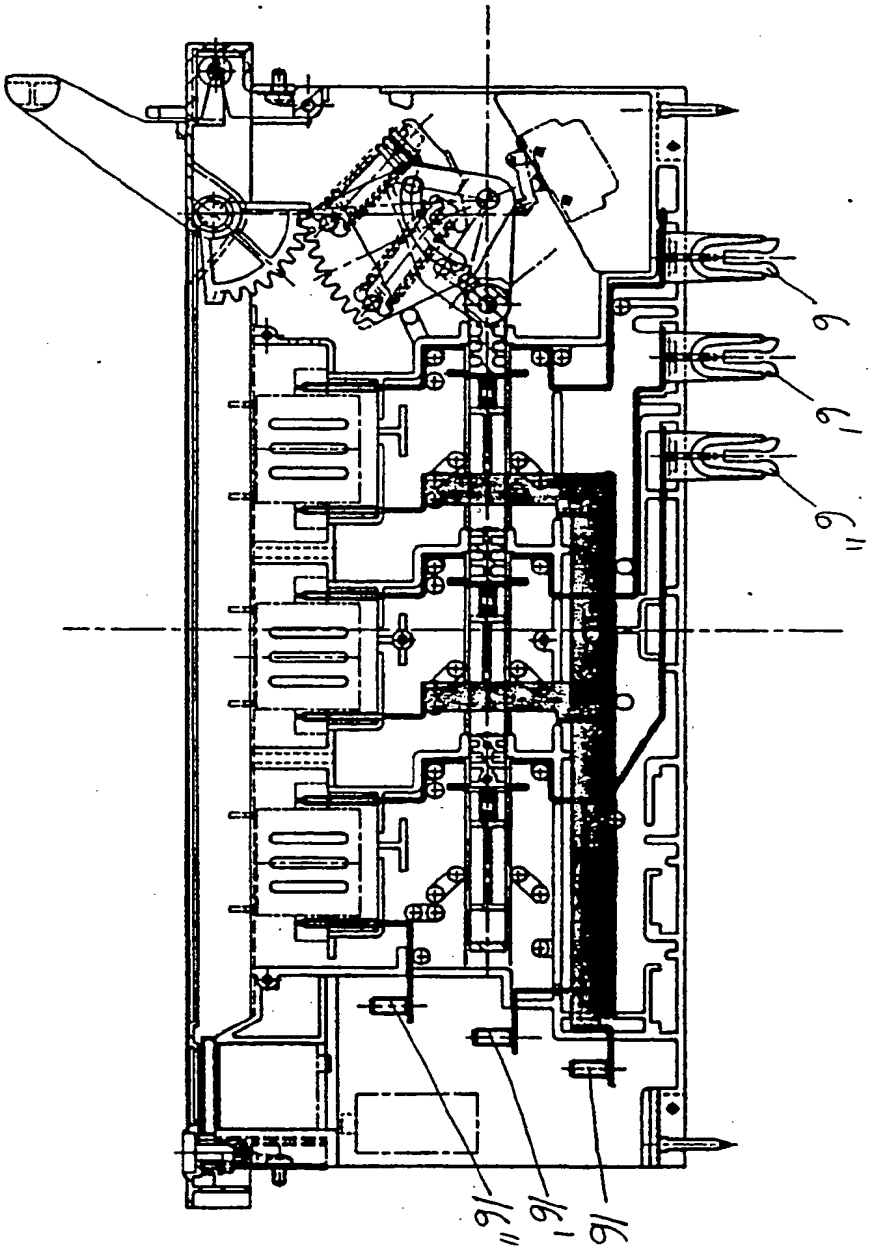

FIG.8

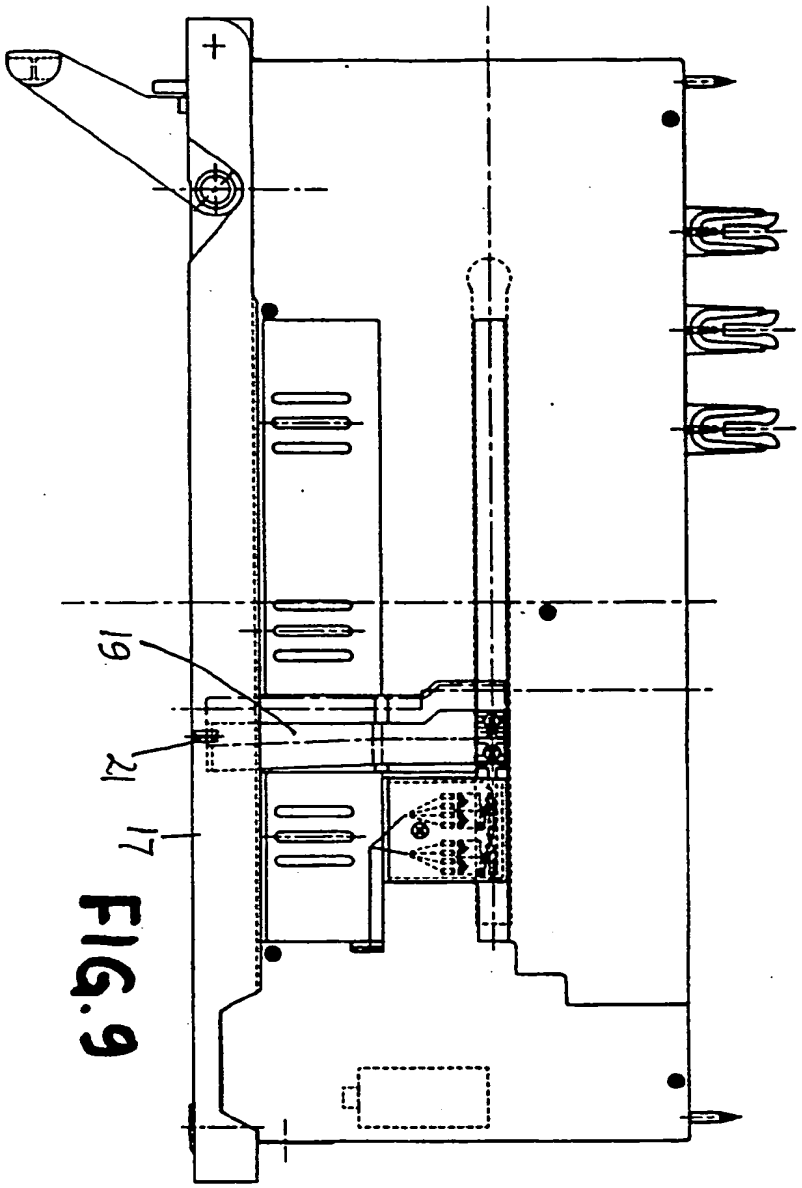

FIG.9

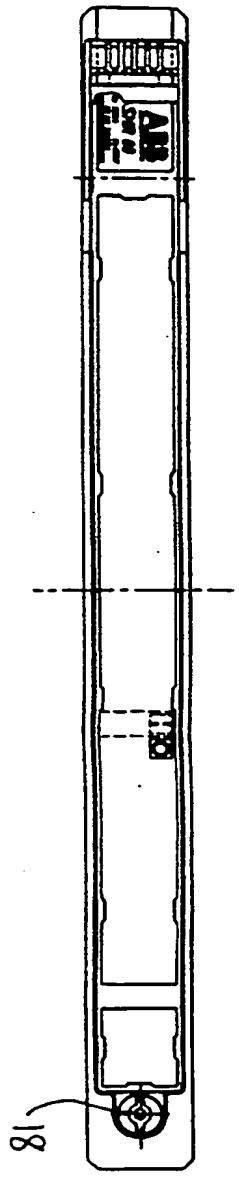

FIG.10

FIG. 11

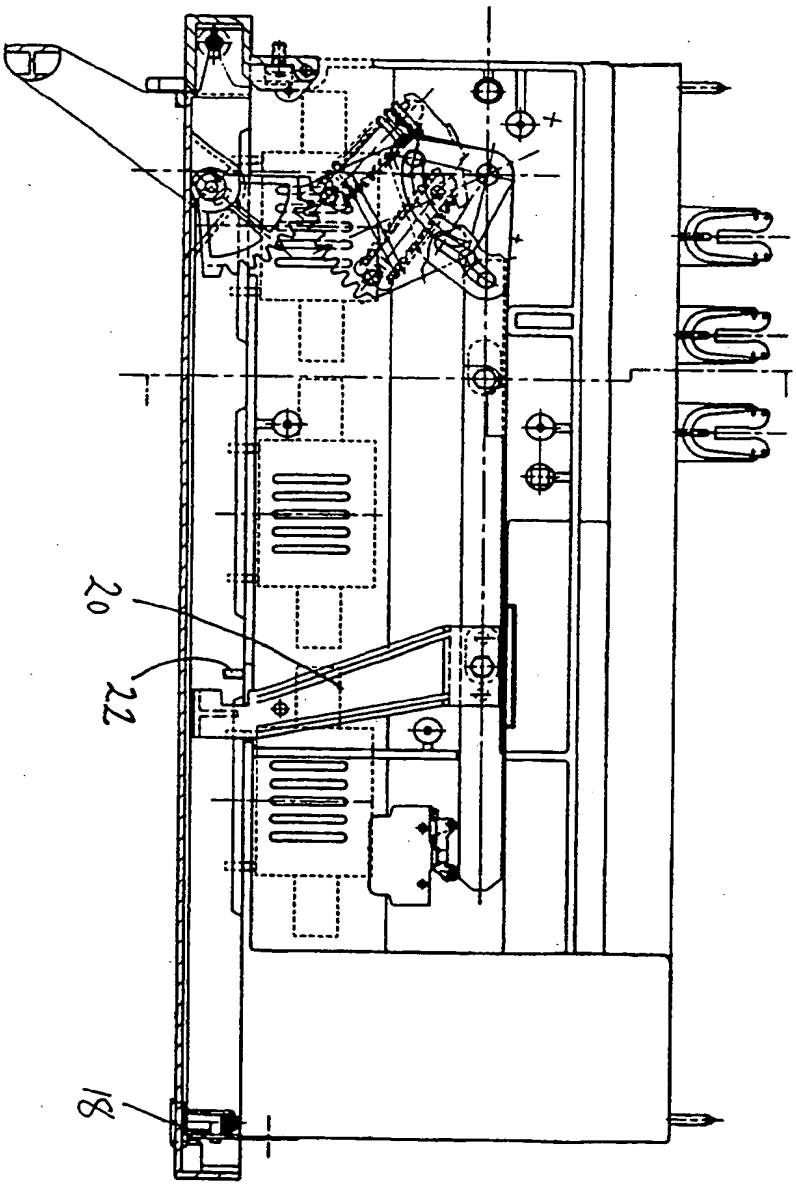

FIG. 12